VI. Taken July 29, 1895. Depth of haul, 25 ft. Killed and preserved in formalin.

VII. Taken July 12, at night. Surface skimming, using a No. 2 Bolting Cloth net. Killed and preserved in 10 per cent. formalin.

VIII. Taken Aug. 1, 1895, at 9 A. M. Depth of haul, 10 ft. Killed in Flemming's fluid. Preserved in 70 per cent. alcohol.

IX. Taken Aug. 7, 1895, at 4 P. M. Depth of haul, 110 ft. Killed in Flemming's fluid. Preserved in 70 per cent. alcohol.

I, II, III, IV, V, VI, VII, VIII are from Turkey Lake or Lake Wawasee; IX is from Tippecanoe Lake.

Decapoda.

The following crayfishes from Turkey Lake were identified by Mr. W. P. Hay, of Washington, D. C.:

Cambarus blandingii acutus Girard.

Cambarus propinquus Girard.

Cambarus virilis Hagen.

On a Small Collection of Mollusks from Northern Indiana. By R. Ellsworth Call, M. D., Ph. D.

The mollusks herewith reported on were collected by the members of the Indiana University Biological Station during the past summer. The region is sufficiently well characterized in the report of Dr. Eigenmann, the Director of the Station, and it is necessary here only to allude to its salient features.

The locality is on the divide separating the drainage areas of the Great Lakes and the Wabash River. In certain places the two drainages are practically identical and thus afford opportunity for the intermingling of the two faunas. The lakes and streams are all well within the limit of glaciation in former ages and their beds and shores are boulder-covered or lined. The bottoms of shallower portions of the lakes are gravelly or muddy, while the deeper portions are either muddy or sandy. Corresponding with these physical factors are certain features of molluscan distribution and modification, which it is the object of these notes to adduce and emphasize.

Unionidæ.

Anodonta decora Lea. Two specimens of this form were found, both of which were obtained in Syracuse Lake. The specimens were very much more fragile and far thinner than is usual for this species, even when secured from lakes and ponds. The epidermis is quite pale, the lines of growth crowded, and the nacreous deposit very white. Forms from sluggishly flowing streams in southern Indiana and elsewhere in the Ohio basin are very highly colored, both interiorly

and without. As in other members of this family from these lakes the optimum habitat does not appear to be here. Many of the shells are coated with heavy deposits of calcareous matter, indicating a chemic condition of the water that is unfavorable to the normal development of the several species.

Anodonta fernssaciana Lea. One specimen from Turkey Creek; three specimens from Syracuse Lake.

The resemblance of these shells to the *Anodonta subcylindracea* is very marked indeed. The lake form is lighter both in texture and color than the one specimen from the creek.

Anodonta footiana Lea. Three specimens from Syracuse Lake; one specimen from Turkey Creek.

The shells submitted are very characteristic of this form, which may not, ultimately, be separated from *Anodonta lacustris* Lea. Like its congeners from the same locality the lake form is very pale in color and unusually thin and fragile. A very interesting fact is illustrated in the littoral distribution of this species and *Sphærium* from the same lake. Those which occur in comparatively deep water are very much thinner and lighter in color than the shore forms. Also, those which are found on the northern shores are thinner and more fragile than those on the southern beach. The reason possibly may lie in the prevailing winds, which are from the northeast. The southern beach is also more gravelly than the northern. The conditions of environment then, in this case, favor thicker development of the shell in the forms living on the southern beach; they need greater powers of resistance, are subjected to rougher conditions of habitat and this finds expression in heavier secretion of nacreous material. The shells which live at the lake's bottom are also beyond the disturbing influence of waves and being deeply imbedded in mud develop to greater size, but with thinner shells.

Margaritana calceola Lea. A single dead specimen, from Turkey Creek.

This specimen is a very characteristic one, the deposit of calcareous matter on the inner surfaces of the valves being marked; this is a pathologic feature, well marked in the type specimens which Dr. Lea studied. This form and *Margaritana deltoidea* Lea are synonyms.

Margaritana rugosa Barnes. Represented by eight specimens from Turkey Creek, all of which are characteristic.

Unio coccineus Lea. One specimen, dead, from Turkey Creek.

The nacre of this shell is quite white, a fact true of the majority of shells which fall under this form, though the type-form was beautifully pink. It is often found in collections labelled *Unio rubiginosus* Lea, but is easily separated

by the characters of the cardinal teeth and the rounded, nonangulate character of the posterior slope. In *Unio rubiginosus* there is a well marked ridge extending quite to the posterior margin. The flat and white nacred form also may occasionally be seen in collections as *Unio gouldianus* Lea, now a well recognized synonym.

Unio fabalis Lea. Twelve specimens from Tippecanoe Lake.

This is one of the smallest of our *Unios*. The shells submitted do not present any variant features other than the very light coloration so characteristic of all the lake shells which we have seen. *Unio lapillus* Say is a synonym.

Unio gibbosus Barnes. This form is represented by three specimens from Turkey Creek. These are all much thinner and lighter than the same species from the Ohio and Wabash rivers, in both of which it is a common shell. It seems to be very abundant in certain of the lakes of northern Indiana, notably Lake Maxinkuckee. The nacre of these three individuals is very dark purple. Similar shells to these probably have led to the reference of *Unio complanatus* Solander to the western fauna.

Unio iris Lea. Two characteristic specimens from Turkey Creek. Like its near relative—which is probably also a synonym—*Unio novieboraci* Lea, this shell occurs most commonly and abundantly in creeks and other small streams. It most affects soft muddy bottoms in rather still waters.

Unio luteolus Lamarck. Ten specimens from Syracuse Lake; seven specimens from Turkey Creek.

This species is the most widely distributed shell of the family. It occurs in every stream, lake and pond in Indiana in which shell life of any sort occurs at all. It is also the most abundant *Unio*, and, correlated with abundance and wide distribution, is a range of variations that are of the greatest import in evolutionary processes. All the shells submitted, particularly those from Syracuse Lake, are well covered, posteriorly, with carbonate of lime in heavy masses. The lake specimens also have beautifully marked green rays widely separated over a polished disk, thus constituting them the form to which Anthony gave the name of *Unio distans*. The epidermis usually has the peculiar coloration of forms which live in muddy bottoms, though in the lake specimens the epidermis is, for some hidden chemical reason, quite red posteriorly. This peculiar coloration has often been noticed in shells submitted to us from the lake region of Northern Indiana.

Unio occidens Lea. Nine characteristic specimens from Turkey Creek. None present features different from shells found elsewhere in the State.

Unio pressus Lea. One specimen from Turkey Creek.

A great many shells of this species have been seen from time to time from various places in Indiana. Very many of them, as this one well does, present a peculiar diseased or pathologic condition of the cardinal teeth not altogether unlike the condition exhibited by the interior surface of *Margaritana calceola*. In this instance the cardinal teeth are nearly destroyed and are represented by distorted and imperfect vestiges. It would be interesting indeed if the Station, during the next season, could investigate this phenomenon as a study in the physiology of *Unio*, a field yet uncultivated.

Unio rubiginosus Lea. Two specimens from Turkey Creek, one of which is pathologic.

These shells are intermediate between *Unio trigonus* Lea and typical *Unio rubiginosus* Lea. They are somewhat more trigonal than the latter shells are commonly found, and, on the other hand, are less heavy and trigonal than the ponderous river form. The whole group is sadly confused and needs painstaking revision.

CORBICULADÆ.

Sphærium rhomboideum Prime. A single specimen only was taken, from Turkey Lake, in muddy bottom and in comparatively deep water. The specimen is very much thinner than usual.

Sphærium solidulum Prime. Ten specimens from Turkey Lake. These are all smaller than common and quite heavy; they came from the beach at Vawter Park.

FRESH-WATER UNIVALVES.

Amnicola porata Say. Eight specimens of this small univalve were obtained in Tippecanoe Lake. Neither it nor others of the univalves found present any characters different from shells found in streams throughout the State.

Campeloma decisum Say. Five dead specimens from Turkey Lake.

Campeloma integrum Dekay. One dead specimen from Turkey Creek.

Campeloma rufum Haldeman. About twenty specimens from Tippecanoe Lake; thirteen, one of which was reversed or sinistral, from Turkey Creek.

There is no difficulty in recognizing these several forms, though tyros annually make the discovery that there are no valid species but one. *Campeloma rufum* differs from both the others constantly by the outlines of the whorls, the shape and color of the aperture, the pink character of the apical whorls, a feature which is best illustrated in the very young and which is a constant character, and in the polished epidermis, which presents a character seen in no other member of the genus. Reversed forms are not uncommon, but yet may be justly considered

rare. The type of the genus is a reversed specimen of *Campeloma ponderosum* from the Ohio River, taken by Rafinesque near Louisville, Ky.

Planorbella campanulata Say. Very abundant in all parts of Tippecanoe Lake.

Helisoma trivolvis Say. Two specimens from Turkey Lake; three specimens from Turkey Creek. The form submitted from Turkey Creek is a very large one, and is rather heavy in texture. The species must be very abundant in favorable localities.

Limnophysa humilis Say. Five specimens of this small limnæid were obtained along the shores of Turkey Lake.

Limnophysa caperata Müller. A single specimen of this common form only was secured. It came from Turkey Lake.

Physa ancillaria Say. Four specimens taken alive, entirely white, from Turkey Lake. This shell is usually honey yellow in coloration, but these specimens were a snow white.

Physa gyrina Say. Only two specimens of the "tadpole" physa appear in the collections, and these came from Tippecanoe Lake. It is one of the most widely distributed and most abundant of the Limnæidæ.

Goniobasis pulchella Anthony. Nine specimens from Turkey Lake; very abundant in Tippecanoe Lake, from which many dead specimens were submitted. This form is widely distributed throughout Indiana. Sometimes associated with it is *Goniobasis livescens* Menke, a form decidedly characteristic of the lake drainage.

Pleurocera subulare Lea. Very abundant in Lake Tippecanoe, from which many dead examples were seen.

Valvata tricarinata Say. A single specimen from Tippecanoe Lake.

LAND MOLLUSCA.

Limax campestris Binney. Four specimens of this widely distributed form were obtained from Vawter Park.

Succinea obliqua Say. This species is represented by ten alcoholic specimens. All taken at Vawter Park.

Zonites arboreus Say. Three alcoholic specimens from Vawter Park.

None of the univalves present features worthy of special mention. The whole collection is rather the result of incidental work than of careful collecting, and is to be taken as somewhat indicative of the wealth of molluscan life in favored localities in Indiana. It is submitted as a local contribution, in the form of a special report, that may help to a general knowledge of Indiana mollusks. Cincinnati, Ohio, November 3, 1895.